No. 809,773. PATENTED JAN. 9, 1906.

F. E. CASE.

EMERGENCY OPERATING MEANS FOR REVERSING SWITCHES.

APPLICATION FILED AUG. 23, 1904.

2 SHEETS—SHEET 1.

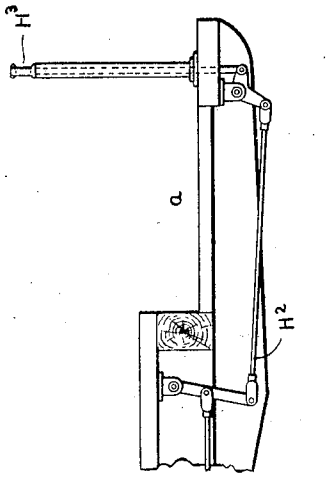


Fig. 5.

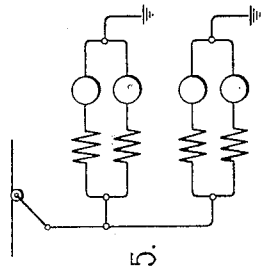


Fig. 6.

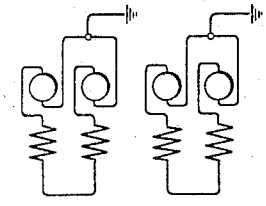


Fig. 1.

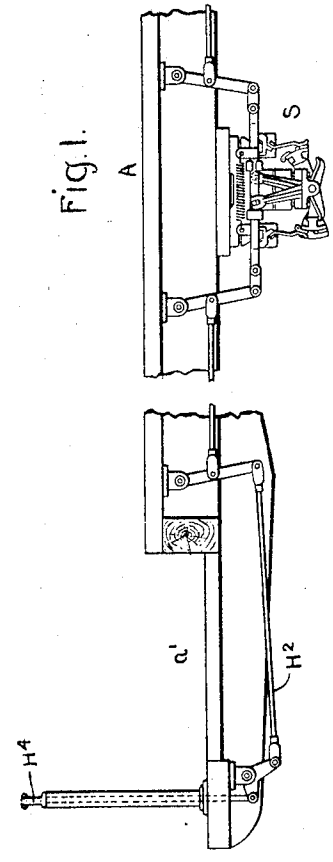
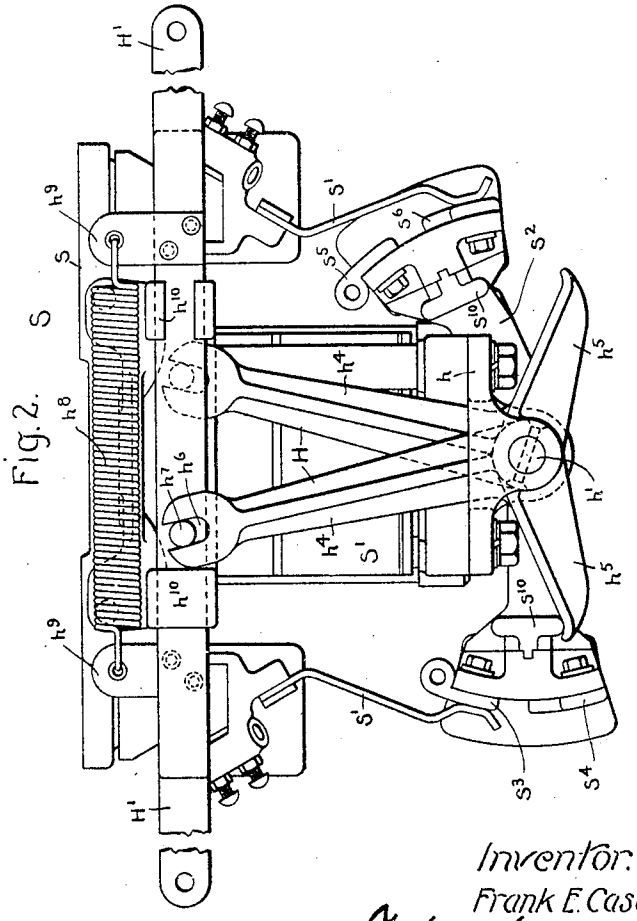


Fig. 2.



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2 SHEETS—SHEET 2.

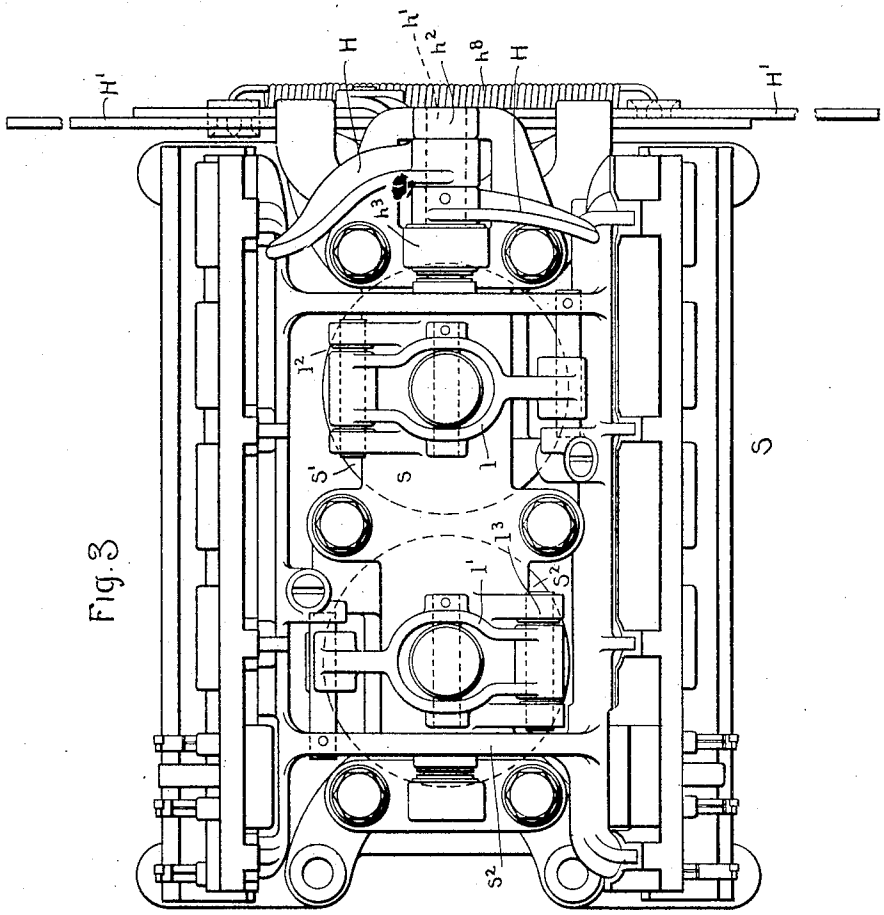

Fig. 3

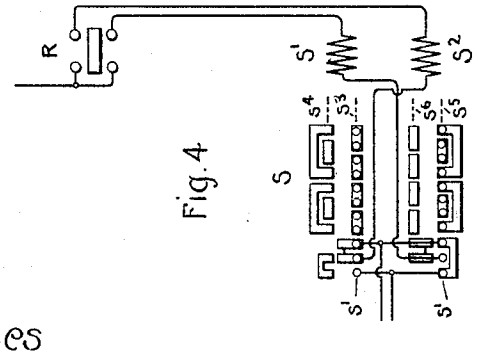

Fig. 4

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UNITED STATES PATENT OFFICE.

FRANK E. CASE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

EMERGENCY OPERATING MEANS FOR REVERSING-SWITCHES.

No. 809,773. Specification of Letters Patent. Patented Jan. 9, 1906.

Application filed August 23, 1904. Serial No. 221,832.

To all whom it may concern:

Be it known that I, FRANK E. CASE, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Emergency Operating Means for Reversing-Switches, of which the following is a specification.

The present invention relates to electric-control apparatus, and more particularly to reversing-switches for motor-cars.

In electric-motor-control equipments a reversing-switch is provided for changing the direction of flow of current through the motors to enable the car or train to be moved backward and forward. When the car or train is running, a reversal of the current through the motors will have a braking effect. If for any reason the current fails on account of the collector-shoe or trolley leaving the rail or trolley-wire, or from any other cause, the reversal of the motor connections enables the motors to still exert a braking effect, since they will then be made to operate in opposition to each other as generators until one overcomes the other and drives or tends to drive it as a motor. It is therefore desirable that the motorman be able to operate the reversing-switch under all conditions, since the motors are never able to produce any appreciable retarding effect unless the circuits are reversed. In equipments wholly electrical the failure of the current also takes away the means for operating the reversing-switch, and consequently prevents the motors from exercising a retarding influence. If now the brakes do not act properly, the car or train is left free to run its course and perhaps do serious damage.

The object of the present invention is to provide means for operating the reversing-switch of a motor-car manually in case of emergency.

To the above end I have arranged a connection from the reversing-switch to each end of the car in such a manner that by operating a handle or lever upon either platform the switch will be thrown to give motor connections for movement in a direction which is reverse relatively to that platform.

Further objects of the present invention will appear in connection with the following description thereof.

The present invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal cross-section of a car, showing in side elevation a reversing-switch containing my improvements. Fig. 2 is a side elevation, upon a larger scale, showing a reversing-switch and the means for operating it manually. Fig. 3 is a plan view of the switch and attachments as viewed from beneath the car. Fig. 4 shows diagrammatically the development of the switch and the master-switch, and Figs. 5 and 6 illustrate diagrammatically the connections of four motors before and after operating the reversing-switch.

Similar reference characters will be employed throughout the specification and drawings to indicate corresponding parts.

A represents a car having end platforms a and a'. The reversing-switch S is mounted beneath the car in the usual manner, and this switch may be of any ordinary or preferred construction, that illustrated being adapted for use in four-motor equipments. The switch comprises a suitable supporting-frame s, on which are mounted the insulated stationary contact-fingers s', and the swinging frame s^2, carrying the groups of movable contacts s^3 and s^4, s^5 and s^6.

Under ordinary conditions the switch is operated from the master-switch R, which causes one or the other of the magnets S′ and S^2 to be energized to throw the switch in the proper direction. The cores of these magnets are suitably connected to the swinging frame carrying the movable contacts, as by means of levers l and l', hinged to the frame s at l^2 and l^3, respectively, and pivotally connected to the cores of magnets S′ and S^2 and to the frame s^2. This construction, however, forms no part of the present invention. Adjacent one end of the swinging frame s^2 I have arranged means for oscillating the frame independently of the magnets. For this purpose a bracket h is secured to or forms part of one end of the supporting-frame of the switch. A shaft h' is seated at one end in a bearing in a boss h^2, projecting from the bracket, and at the other end in a boss h^3, which may likewise serve to pivotally support one end of the swinging contact-carrying frame. Secured to the shaft h' are two bell-crank levers H H, each having one arm h^4 extending upwardly

and the other, h^5, laterally, the two latter arms extending in opposite directions, however. The arms h^5 are so proportioned that when one or the other lever is operated its respective arm h^5 engages with one of the ribs s^{10} on the swinging frame and moves the frame to one of its positions if it does not already occupy that position, the position to which the switch is moved depending upon the lever which is operated.

The arms h^4 of the levers H are provided with slots h^6 in their upper ends for the purpose of receiving pins h^7, projecting from sliding operating-rods H′, connected, respectively, through suitable intermediate links and lever mechanism H^2 to handles H^3 and H^4 upon the car-platforms. A spring h^8 has its ends secured, respectively, to ears h^9, projecting from the rods H′. When one or the other of the handles is pulled upon, operating its respective rod, the ear h^9 of the other rod abuts against one of the guides h^{10}, in which the rods are mounted, causing the spring h^8 to be placed under tension, and when the handle is released the spring returns the lever to its normal position, so that when the line-current is again available the switch may be moved to its proper running position through the master-switch.

While I have shown or described the handles or levers H^3 and H^4 as being situated upon the car-platform, it is of course evident that their absolute location is immaterial, since it is simply desired that they shall be near the operator in the positions which he occupies when running the car in one direction or the other, and I employ the term "platform" in such broad sense.

The connections to the operating-levers H are so arranged that when the car is being run in a forward direction from either end a pull upon the emergency-handle can only reverse the motor connections, while if the car is being run backwardly no effect is produced by pulling the handle. It is evident that by this arrangement there is no alternative for the motorman, and if he operates the emergency-handle at all the desired result is produced.

As shown in the drawings, the switch is set for causing the car to move forwardly relatively to platform *a*, and if the handle H^3 is pulled the switch S is reversed. A pull on handle H^4 while the switch remains in the position shown, although it would operate its bell-crank lever, would not disturb the switch itself, thereby preventing tampering with the switch from the rear of the car.

Fig. 4 illustrates diagrammatically a developed master reversing-switch R and the switch S.

In Fig. 5 I have illustrated four motors connected in parallel in groups of two for propelling the car or train forwardly. When the current is interrupted and the motors become the driven members, they generate current opposite in direction to that which previously flowed through them from the line as long as there is any residual magnetism in the field-magnets; but the generated current tends to give the field-magnets just the opposite magnetization. As a result current will be generated only until the field-magnets have been completely deënergized, whereupon the armatures are driven without producing any current, exerting practically no retarding influence.

In Fig. 6 the armature connections of the groups of motors are shown as having been reversed by the emergency device, and it is apparent that when the line-current is interrupted and the motors are driven as generators the generated current increases the field excitation and the motors continue to act as generators. Since no two of the motors will be exactly alike in construction, their electromotive forces will differ correspondingly, so that finally the weaker generator or generators will be driven as motors by those having the higher electromotive forces, the torque of these motors being exerted to retard the movement of the car or train.

While I have described my invention as embodied in the best form now known to me, the present invention is not limited to the particular details shown and described, since in the broader aspects it may be embodied in many other forms.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A motor reversing-switch, service-operating devices for said reversing-switch comprising electromagnetic actuating means, and means arranged adjacent to said reversing-switch but disconnected therefrom for operating said reversing-switch manually upon failure of current to said electromagnetic actuating means.

2. A motor reversing-switch, service-operating devices therefor, and means located on each car-platform whereby the switch may be operated to move it in one direction only.

3. A motor reversing-switch, service-operating devices therefor and means located at one end of the car for moving the switch in one direction, and means at the other end of the car for moving the switch in the opposite direction.

4. A motor reversing-switch, service-operating devices therefor, and means at one end of the car whereby the switch may be reversed when it is set to cause the car to be propelled forwardly with respect to that end of the car.

5. A motor reversing-switch, service-operating devices therefor, and means located at one end of the car whereby the switch may be operated to move the switch to its reverse

position relatively to that end of the car, but not to its forward position.

6. A motor reversing-switch, service-operating devices therefor, and means operable from each end of the car for throwing the switch to its reverse position relatively to that end of the car.

7. A motor reversing-switch, service-operating devices therefor, and means operable from each end of the car for throwing the switch to its reverse position relatively to that end of the car, but not to its forward position.

8. A motor reversing-switch, service-operating devices therefor, manually-operated mechanism for moving said switch, and means for returning said manually-operated mechanism to its normal position after it has performed its function.

9. A motor reversing-switch, service-operating devices therefor, a lever, means for bringing the lever into contact with the movable member of the switch for operating it, and means for returning the lever to its normal position after it has performed its function.

10. A motor reversing-switch, a pair of levers arranged adjacent the movable member thereof but disconnected therefrom, and an operative connection extending from each lever to one end of the car for actuating the lever.

11. A motor reversing-switch, a pair of levers mounted adjacent the movable member thereof but disconnected therefrom, a connection extending from one lever to one end of the car, and a second connection extending from the other lever to the other end of the car.

12. A motor reversing-switch, a pair of bell-crank levers pivotally mounted adjacent the movable member of the switch and each having an arm operatively associated with said movable member, and a connection extending from each lever to one end of the car.

In witness whereof I have hereunto set my hand this 22d day of August, 1904.

FRANK E. CASE.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.